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Analytical approach for the approximate solution of the gluon distribution function with respect to the GLR-MQ evolution equation at small-x

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In this paper we show that the singularity behavior of gluon distribution function at small-x can be controlled by the nonlinear corrections to the gluon distribution function with respect to GLR-MQ equations. For the gluon distribution the nonlinear effects are found to play an increasingly important role at $x \leq 10^{-3}$ and $Q^2 \leq 20 \text{ GeV}^2$, but rapidly vanish at higher values of x and Q^2 . We compare our results with H1 and ZEUS data and with the global QCD fits viz. MSTW2008, CT10. Our results show that nonlinear gluon distribution function increases as x decreases which also corresponds with perturbative quantum chromodynamics (QCD) fit at small-x, but this behavior is tamed with respect to nonlinear terms at GLR-MQ equation.

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